



What Is Claimed Is:

- 1 1. A MOS (metal on semiconductor transistor) structure for ESD
2 protection, comprising:
3 an active region, defined on a substrate of a second-type
4 conductivity;
5 a channel region separating the active region into a first
6 drain/source region and a second drain/source region;
7 at least one first island, formed on the first drain/source
8 region and having a first conductive segment and a first
9 gate oxide segment of the first thickness, the first
10 conductive segment being stacked on the first gate oxide
11 segment;
12 a doped drain region of a first-type conductivity in the first
13 drain/source region, defined substantially by a field
14 oxide region, the channel region and the at least one first
15 island; and
16 a breakdown-enhanced layer, formed in the first drain/source
17 region and contacting the doped drain region, to reduce
18 a breakdown voltage across the doped drain region and the
19 substrate.
- 1 2. The MOS structure as claimed in claim 1, wherein the MOS
2 structure has, within the active region, two breakdown-
3 enhanced layers with the same depth and the same dosage, and
4 one of the breakdown-enhanced layers is inside the first
5 drain/source region while another is outside the first
6 drain/source region.



1 3. The MOS structure as claimed in claim 1, wherein the
2 breakdown-enhanced layer has the first-type conductivity.

1 4. The MOS structure as claimed in claim 1, wherein the
2 breakdown-enhanced layer also forms pocket-implanted
3 structures of internal MOS.

1 5. The MOS structure as claimed in claim 1, wherein the
2 breakdown-enhanced layer has the second-type conductivity.

1 6. The MOS structure as claimed in claim 1, wherein the
2 breakdown-enhanced layer also forms anti-punch-through
3 structures of internal MOS.

1 7. The MOS structure as claimed in claim 1, wherein the
2 breakdown-enhanced layer is formed under the doped drain
3 region.

1 8. The MOS structure as claimed in claim 1, wherein the channel
2 region has a gate structure consisting of a second conductive
3 segment and a second gate oxide segment, the second
4 conductive segment being stacked on the second gate oxide
5 segment.

1 9. The MOS structure as claimed in claim 8, wherein the second
2 gate oxide and the first gate oxide have the same thickness.

1 10. The MOS structure as claimed in claim 8, wherein the second
2 gate oxide and the first gate oxide have different
3 thicknesses.



1 11. The MOS structure as claimed in claim 10, wherein the second
2 gate oxide is thicker than the first gate oxide.

1 12. The MOS structure as claimed in claim 11, wherein the
2 breakdown-enhanced layer is formed at the at least one first
3 island breakdown-enhanced layer and an internal-circuit MOS
4 transistor with the first gate oxide thickness
5 simultaneously.

1 13. The MOS structure as claimed in claim 1, wherein the
2 breakdown-enhanced layer is not formed in the second
3 drain/source region.

1 14. The MOS structure as claimed in claim 1, wherein the channel
2 region has a field oxide stacked on the substrate.

1 15. An electrostatic discharge protection device on a substrate
2 of a second-type conductivity, comprising:
3 a source region of a first-type conductivity, coupled to a
4 power rail;
5 a drain region of the first-type conductivity, coupled to a
6 pad via a contact;
7 a first gate structure placed between the source region and
8 the drain region, for controlling electric connection
9 between the drain region and the source region; and
10 a second gate structure substantially surrounded by the drain
11 region, for distancing the contact from the first gate
12 structure;



13 wherein the first gate structure and the second gate
14 structure receives different implant treatments.

1 16.The electrostatic discharge protection device as claimed in
2 claim 15, wherein the second gate structure distances the
3 contact from the first gate structure.

1 17.The electrostatic discharge protection device as claimed in
2 claim 15, wherein the first gate structure includes an
3 adjacent first doped junction; the second gate structure
4 includes an adjacent second doped junction; and the first and
second doped junctions have different doping profiles.

1 18.The electrostatic discharge protection device as claimed in
2 claim 15, wherein a gate oxide of the first gate structure
3 and a gate oxide of the second gate structure have the same
4 thickness.

1 19.The electrostatic discharge protection device as claimed in
2 claim 15, wherein a gate oxide of the first gate structure
3 and a gate oxide of the second gate structure have different
4 thicknesses.

1 20.The electrostatic discharge protection device as claimed in
2 claim 15, wherein the gate oxide of the first gate structure
3 is thicker than the gate oxide of the second gate structure.

1 21.The electrostatic discharge protection device as claimed in
2 claim 15, wherein the second gate structure receives
3 breakdown-enhanced implantation while the first gate



4 structure is sheltered from the breakdown-enhanced
5 implantation.

1 22.The electrostatic discharge protection device as claimed in
2 claim 21, wherein the breakdown-enhanced implantation is
3 pocket implantation to form pocket-implanted structures.

1 23.The electrostatic discharge protection device as claimed in
2 claim 21, wherein the breakdown-enhanced implantation is
3 anti-punch-through implantation.

1 24.The electrostatic discharge protection device as claimed in
2 claim 21, wherein the breakdown-enhanced implantation is to
3 form a breakdown-enhanced layer under the drain region.

1 25.The electrostatic discharge protection device as claimed in
2 claim 24, wherein the breakdown-enhanced layer has the
3 second-type conductivity.

1 26.An electrostatic discharge protection device, comprising:
2 an active region on a substrate of a second-type
3 conductivity;
4 a first gate structure and a second gate structure, both being
5 placed on the active region;
6 at least one drain region of a first-type conductivity and
7 one source region of the first-type conductivity, defined
8 and separated by either the first gate structure or the
9 second gate structure; and



10 a breakdown-enhanced layer, formed within the drain region
11 to reduce a breakdown voltage across the drain region and
12 the substrate.

1 27.The electrostatic discharge protection device as claimed in
2 claim 26, wherein the at least one drain region and one source
3 region are respectively coupled to a pad and a power rail.

1 28.The electrostatic discharge protection device as claimed in
2 claim 26, wherein the breakdown-enhanced layer is not present
3 within the source region

1 29.The electrostatic discharge protection device as claimed in
2 claim 26, wherein a gate oxide of the first gate structure
3 is thicker than a gate oxide of the second gate structure.

1 30.The electrostatic discharge protection device as claimed in
2 claim 26, wherein the first gate structure separates the
3 active region into two drain/source regions as well as the
4 second gate structure does.

1 31.The electrostatic discharge protection device as claimed in
2 claim 26, wherein the breakdown-enhanced layer has the
3 first-type conductivity.

1 32.The electrostatic discharge protection device as claimed in
2 claim 31, wherein the breakdown-enhanced layer also forms
3 pocket-implanted structures of internal MOS.



1 33.The electrostatic discharge protection device as claimed in
2 claim 26, wherein the breakdown-enhanced layer has the
3 second-type conductivity.

1 34.The electrostatic discharge protection device as claimed in
2 claim 26, wherein the breakdown-enhanced layer also forms
3 anti-punch-through structures of internal MOS.

1 35.The electrostatic discharge protection device as claimed in
2 claim 26, wherein the breakdown-enhanced layer is formed
3 under the doped drain region.